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(54) **CHANGING APPEARANCE GLASS TILE**

GLASFLIESE MIT VERÄNDERLICHEM ERSCHEINUNGSBILD

TUILE DE VERRE A CHANGEMENT D'APPARENCE

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Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to glass tiling materials used as surface covering in decoration and construction field. Stated more particularly, the present invention is about achieving a glass tiling material which has changing appearances according to the viewers observation angle achieved by uniting glass and lenticular image.

BACKGROUND OF THE INVENTION

[0002] For many years, natural and artificial construction materials have been used for tiling interior and exterior faces of buildings. Marble, granite, and ceramic tiles of various kind are the most often used surface covering materials. In addition to being decorative, surface covering material used should be functional, exhibiting the following characteristics: long durability, resistance to weather effects, resistance to corrosion, inert behavior to chemicals, hygiene, thermal insulation properties, resistance to abrasion, and at the same time it should also be economical in both production and installation costs. It is known that no natural or artificial material meets all the aforementioned requirements.

[0003] Additionally all known artificial and natural covering materials has fixed images. Even presently fabricated glass tiles have fixed images and pictures. Glass tiles as stated in US Pat. No. 1454842 has been known since 1923's. This material has changed in years and glass tiling material technique has been developed in years as the following example patents:

CN Pat. No. 1090006	07, 1994	Glass tile for decoration and production thereof
US Pat. No. 5792524	08, 1998	Decorative construction material
US Pat. No. 5997672	12,1999	Glass photo tile
DE Pat. No. 19813711	09, 1999	Glass tile with a durably attached decorative pattern
US Pat. No. 6042905	03,2000	Decorative construction material and methods of its production
GB Pat.No. 2349362	11, 2000	Decorative glass tile with slumped edges and painted rear surface

[0004] Covering materials that are composed of glass with graphic or photographic images are the techniques known state. The difference between this invention and existing glass tiles is achieved by uniting glass with a lenticular image. Lenticular image technique has been known since 1940's which enables changing appearances according to the viewers observation angle. Lenticular image technique has been explained in US Pat. No. RE35029 dated August 1995. Some patents for the lenticular image technique are as follows:

US Pat. No. 2815310	12, 1957	Process of assembling in the art of changeable picture display devices
US Pat. No. 5276478	01, 1994	Method and apparatus for optimizing depth images by adjusting print spacing
US Pat. No. 5924870	07, 1999	Lenticular image and method
US Pat. No. 6115101	09, 2000	Method and apparatus for producing three-dimensional images with motion
US Pat. No. 6211896	04, 2001	Method for producing lenticular images
US Pat. No. 6252621	06, 2001	Printing lenticular images

[0005] According to the techniques known state, lenticular image techniques has developed in time. As a result, along with different printing techniques, different image effects have been developed. The current effects which are still being developed can be described as follows:

a) Flip: The quick transition between two or more distinct graphical elements depending on the viewers observation angle.
b) Motion: As the viewing angle changes, rotation of an image on an axis or achieving a motion in one or multiple directions.
c) Morph: As the viewing angle changes, a fluid transition between one graphical element to another graphic element, usually of like size and shape.
d) Zoom: As the viewing angle changes, image moves front to back gaining or decreasing in size.
e) Animation: As the viewing angle changes, usage of about 50 frames from a video to form a small video clip.
f) 3D: Without the need of change in the viewing angle, the optical illusion of depth and distance between elements from the foreground to the background.

[0006] Glass as a material, in relation to other natural and artificial covering materials, is known to be resistant to weather effects, fading, and to chemicals. Characteristics of the glass material used in changing appearance glass tile is as stated below:

Standard	Physical features	Required result for tiles	Result
EN 99	Water absorption	Average ≤3, max for each 3,3	0,0 %
EN 100	Modulus of rupture	Minimum 27 MPa	65,6 MPa
EN 104	Thermal shock resistance	Resistant	Resistant
EN 105	Cracking resistance	Resistant	Resistant
EN 106,22	Chemical resistance	Resistant	Resistant
EN 176	Size allowance	±0,5%	±0,1%
EN 202	Frost Resistance	Min. 50 cycles at -15°C/+15°C	Resistant
ISO 7991	Thermal lin. expansion coefficient (20-300°C)	Max 9.10^{-6} K^{-1}	$8,61.10^{-6}$ K^{-1}
IP F-11-95	Sudden temperature variation resistance	Resistant	Resistant
IZP - 01	Light resistance determination	No changes	No changes

[0007] Along with the advantages of glass material, by using the effects brought by lenticular imaging technique, changing appearance glass tiling material is bringing new dimension to the decoration and construction field. With this invention themed environments can be achieved more realistically and effectively. In relation to regular tiles, changing appearance glass tiles will bring constant variation and differentiating living spaces to its environment through the use of different color, design, graphic and image effects. For example, instead of ceramic tiles which has fixed designs, with the use of this invention on the wall tiles by using motion effect, swimming fish in a wavy sea and on the floor tiles by depth effect, shimmering of underwater world can be achieved. A decorative construction material is disclosed in document EP-A-0425670.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Changing appearance glass tile is described in detail in reference to the attached drawings. These drawings are:

Figure 1, description of the changing appearances according to the observation angle of the final invention.
Figure 2, description of the formation steps of the invention.

(1) More than one image
(2) Computer program
(3) Interlaced one image
(4) Lenticular film
(5) Lenticular image
(6) Glass
(7) Adhesive material
(8) Changing appearance glass tile

DETAILED DESCRIPTION OF THE INVENTION

[0009] Changing appearance glass tile (8) is made up of three parts:

a) Colored, non-colored, transparent, translucent, or all kinds of different size, shape, form, and thickness of glass (6)
b) Lenticular image (5)
c) Adhesive material (7)

[0010] Colored, non colored, transparent, translucent or any type, any size, form, and thickness of glass (6) can be used in this invention. By general meaning, glass is any of a large class of materials with highly variable mechanical and optical properties that solidify from the molten state without crystallization, that are typically based on silicon dioxide, boric oxide, aluminum oxide, or phosphorus pentoxide, that are generally transparent or translucent. Recommended material for this invention is "float glass". Float glass production is based on "floating" the molten glass on molten tin. This process allows the glass surface to be perfectly parallel and completely free from surface defects. Manufacturing of float glass is preferably should be according to the Turkish Standards 10288. Tinted float products are manufactured

by adding coloring agents to the raw batch before the melting process. Float glass, weather colored or not, could be used by cutting, bending, sanding, laminating. Preferably in this invention, glasses with 5mm and 8mm thickness are to be used and preferably after being cut in ceramic tile sizes, the edges are to be flat grinded.

[0011] Lenticular image (5), is made up of four phases according to the technologies current status. More than one image (1) is divided into dozens of parallel strips per cm with the use of special computer programs (2) and are interlaced in to one picture (3) so very thin strip of each image is printed next to a strip from the next which only makes sense if it is looked trough a lenticular film (4).

[0012] Lenticular film (4) is a semi cylindrical formed, precisely specified dimensioned, ribbed transparent plastic which allows the observer to see one image at a time. In general, materials for production of lenticular films (4) are vinyl, acrylic, and Eastman Chemical's Eastar PETG co-polyester. Lenticular film (4) has different thickness and also has a different visual effect in relation to the amount of lenticules per cm.

[0013] An interlaced image (3) with special computer programs (2), is either printed behind a lenticular film (4) or printed on a graphic film and then laminated to a lenticular film (4). Since lenticular film (4) has a ribbed finish, it allows only portions of the background to be seen, which allows the interlaced image (3) made up of two or more images (1) to be seen one at a time as the observation angle changes.

This lenticular image (5) is than attached to a glass (6) with the help of an adhesive material (7). For this adhesion, film adhesives are preferred. Depending to the film adhesives characteristics, according to the invention optically clear ones are to be placed in between lenticular image (5) and glass (6), others preferably are to be placed underneath the lenticular image (5) which is underneath the glass (6) holding the glass from the sides.

[0014] Changing appearance glass titles can be manufactured in any form and in any standard sizes or custom sizes which can be installed by any experienced tile installer.

[0015] Application of changing appearance glass tile:

a) Equipment: Ceramic cutting machine equipped with a diamond cutter, scrubbing brush, drilling machine with a diamond bit, try square, grind stone, tungsten carbide hand saw, pliers, penetration coating, cement based adhesives, silicon based adhesives, regular jointing material, water cooling system, craft knife, safety goggles, diamond surface steel wire saw, spreader, and trowel.

b) Base preparation: Base must be solid and dry, without cracks and unevenness. It must also be clean and free from elements which impairs adhesion.

c) Penetration coating: For highly absorbent bases like gypsum walls, suitable penetration coating is recommended.

d) Hand cutting glass tiles: A diamond hand-cutter can be used for drawing any shape and length to be cut. Separation is then achieved by knocking the cut from behind. A craft knife is used for cutting lenticular image in any shape.

e) Machine cutting glass tiles: A ceramic cutting machine equipped with diamond cutter and water cooling system is recommended for easy cutting. When cutting off a corner sector, drilling a hole in the top of a corner sector first is recommended which will prevent the tile from breakage. Irregular shapes can be cut off with a saw which has a diamond surface steel wire. Lenticular image can be separated from the pieces easily with a craft knife. A combination of hand and machine cutting is also suitable.

f) Edge grinding: Hand grinding; use grinding stone for glass soaked in water.

g) Edge grinding for professionals: If multiple quantity of tiles need to be grinded, machine grinding can be used; different types of grinding wheels are used for this purpose.

h) Hole drilling: Always use a water cooling system when drilling. Rough-drilling on the back of the tile with a diamond bit drill for cutting glass will avoid any chipped edges when finishing the drilling from the front side.

i) Hole drilling on a fixed glass tile: With a drilling machine, a diamond bit drill for cutting glass is used.

j) Using a saw: For cutting large holes and different shapes tungsten carbide handsaws are recommended.

k) Fixing: When applying adhesives application onto the base, a spreader with 3-4mm teeth is used. Adhesive has to be spread equally all over the back of the tile. Absorbent base - we recommend cement based adhesives with flexible additives. Non - absorbent base - silicon based or two component adhesives.

l) Application: Application of glass tiles on vertical surfaces is started from the bottom. For achieving an even surface pressure is applied for adhesion.

m) Jointing: Commonly used jointing materials is used with a trowel after the application is dry according to the manufacturers recommendations. For achieving an even surface pressure is applied for adhesion and left to dry according to the jointing material manufacturers recommendations.

n) Cleaning: After the joints are dry, a wet sponge is use for cleaning the surface. The overflowing materials can be cleaned with regular cleaning liquids.

[0016] In light of the basic physical characteristics of the changing appearance glass tiles, the following uses suggest potential markets:

Bathrooms: Showers, tub areas, walls, floors, counters
Kitchens: Walls, floors, counters
Ceiling, floor, wall decorations
Murals of any dimension
Signage: Airports, subways, public areas
Logos: Size flexibility, weather resistant
Swimming Pools
Decorative tiling of nurseries
Souvenirs
Commercial & Mass Market

[0017] The versatility of the new concept product suggests direct marketing to the following potential users:

Architecture Companies
Construction Companies
Developers
Airports
Theme Parks
Hotels
Entertainment facilities like bars and discos
Business headquarters
Shopping malls
Hospitals
Libraries
Restaurants

Claims

1. A construction material which is a layered glass tile (8) having changing appearances according to the viewers observation angle comprising of three layers:

a. a top layer (6) being a plate of glass which is transparent and smooth on both faces;
b. a middle layer (7) being an adhesive which is optically clear and transparent, that laminates the top layer to the bottom layer and;
c. a bottom layer (5) being a decorative lenticular image product, comprising interlaced images (3), forming a lenticular image, which is made up of more than one image divided in to dozens of strips per cm and being interlaced in to one image, whereby a very thin strip of each image is printed next to a strip from the next image (1,2) and a lenticular film (4), which is semicylindrical formed, ribbed transparent plastic, which allows to see changing appearances according to the viewers observation angle, with the visual effects obtainable are flip, motion, morph, zoom, animation, and/or 3D depth, whereby the lenticular film is placed between said middle layer and said lenticular image, which latter is either printed on said lenticular film or printed on a graphic film (3) and laminated on said laminated film.

2. A construction material according to Claim 1 wherein said adhesive layer is also placed underneath the lenticular image (5) which is underneath the glass (6) holding the glass from the sides.

Patentansprüche

1. Ein Konstruktionsmaterial bestehend aus einer beschichteten Glasfliese, dessen Erscheinungsbild entsprechend dem Zuschauerbeobachtungswinkel sich ändert, weist drei Schichten aus:

a. eine obere Schichte bestehend aus einer Glasscheibe, welche beidseitig transparent und glatt ist"
b. die mittlere optisch klar und transparente Kleberschichte (7), die die obere Schichte zur unteren lamelliert,
c. eine die untere Schichte (5)- ein dekoratives linsenförmiges Bildprodukt, das ineinander verflochtene Bilder (3) enthält, die ein linsenförmiges Image bilden, welches aus mehr als einem Bild zusammensetzt ,das pro Zentimeter in zu Dutzenden von Streifen geteilt ist und zu einem Bild verschachtelt ist, wobei ein sehr dünner

Streifen jedes Bildes beim nächsten Streifen vom folgenden Bild gedruckt wird (1.2) und ein linsenförmiger Film (4), der halb zylinderförmig geformt ist, gerippter durchsichtiger Kunststoff, welcher dem Zuschauerbeobachtungswinkel entsprechend sich ändernde Erscheinungsbilder mit den visuellen Effekten wie Klaps, Bewegung, Morph, Zoom, Animation und/oder 3D Tiefe zu sehen erlaubt, wobei der linsenförmige Film zwischen der genannte mittleren Schichte und dem genannte linsenförmigen Bild plaziert wird, der letzte entweder auf den gesagten linsenförmigen Film oder auf einen grafischen Film (3) gedruckt und auf den genannten lamellierten Film lamelliert wird.

2. Ein Konstruktion material nach Anspruch 1, worin die klebende Schichte auch unter dem linsenförmigen Image plaziert ist, welches unter dem Glas ist und das Glas von Seiten hält.

Revendications

1. Un matériel de construction étant une tuile en vitre (8) avec une couche, ayant de différentes apparences selon l'angle d'observation des spectateurs, comprenant trois couches :

a. une couche supérieure (6) étant une plaque en vitre, dont les deux faces sont transparentes et lisses;
b. une couche adhésive intermédiaire (7) optiquement claire et transparente, qui lamine la couche supérieure à la couche inférieure,
c. une couche inférieure (5) étant un produit d'image lenticulaire décorative, comprenant des images entrelacées (3), formant une image lenticulaire produite de plus d'une seule image divisée aux douzaines de bande par cm et entrelacée en une seule image dans lequel une bande très fine de chaque image est imprimée à côté d'une bande de l'autre image (1,2) et un film lenticulaire (4) en forme d'un demi cylindre, en plastique transparent à nervure, qui permet de voir les changements d'apparences en accordance avec les angles d'observation des spectateurs, avec les effets visuels qu'on peut obtenir sont rotation, mouvement, morphème, zoom, animation, et/ou de profondeur 3D, dans lequel le film lenticulaire est placé entre ladite couche intermédiaire et ladite image lenticulaire, que cette dernière est soit imprimée sur ledit film lenticulaire ou imprimée sur un film graphique (3) et laminée sur ledit film laminé.

2. Un matériel de construction selon la revendication 1 **caractérisé en ce que** ladite couche adhésive est aussi placée en dessous de l'image lenticulaire (5) qui se trouve en dessous de la vitre (6) et qui la tient des côtés.

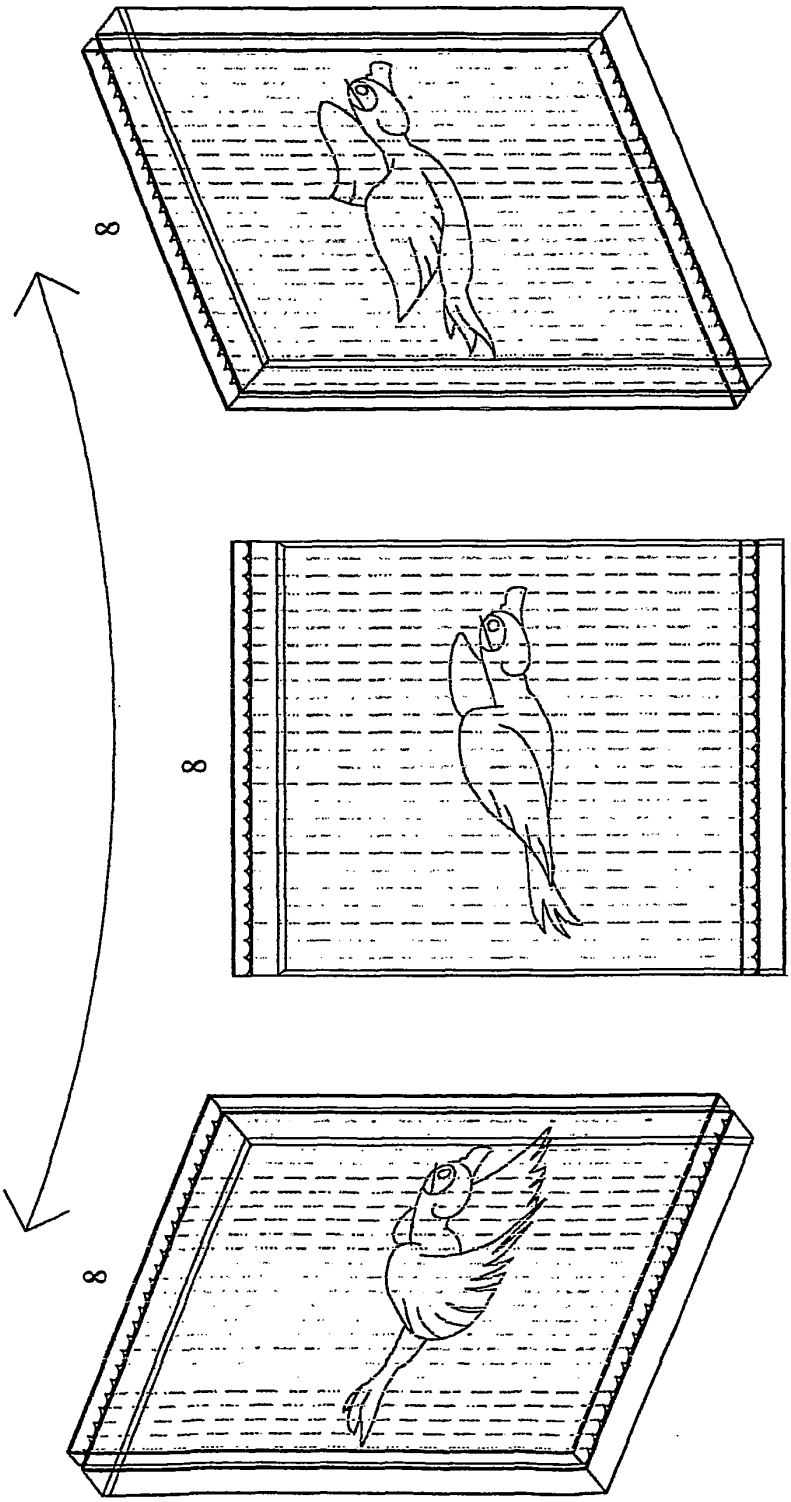

Fig.1

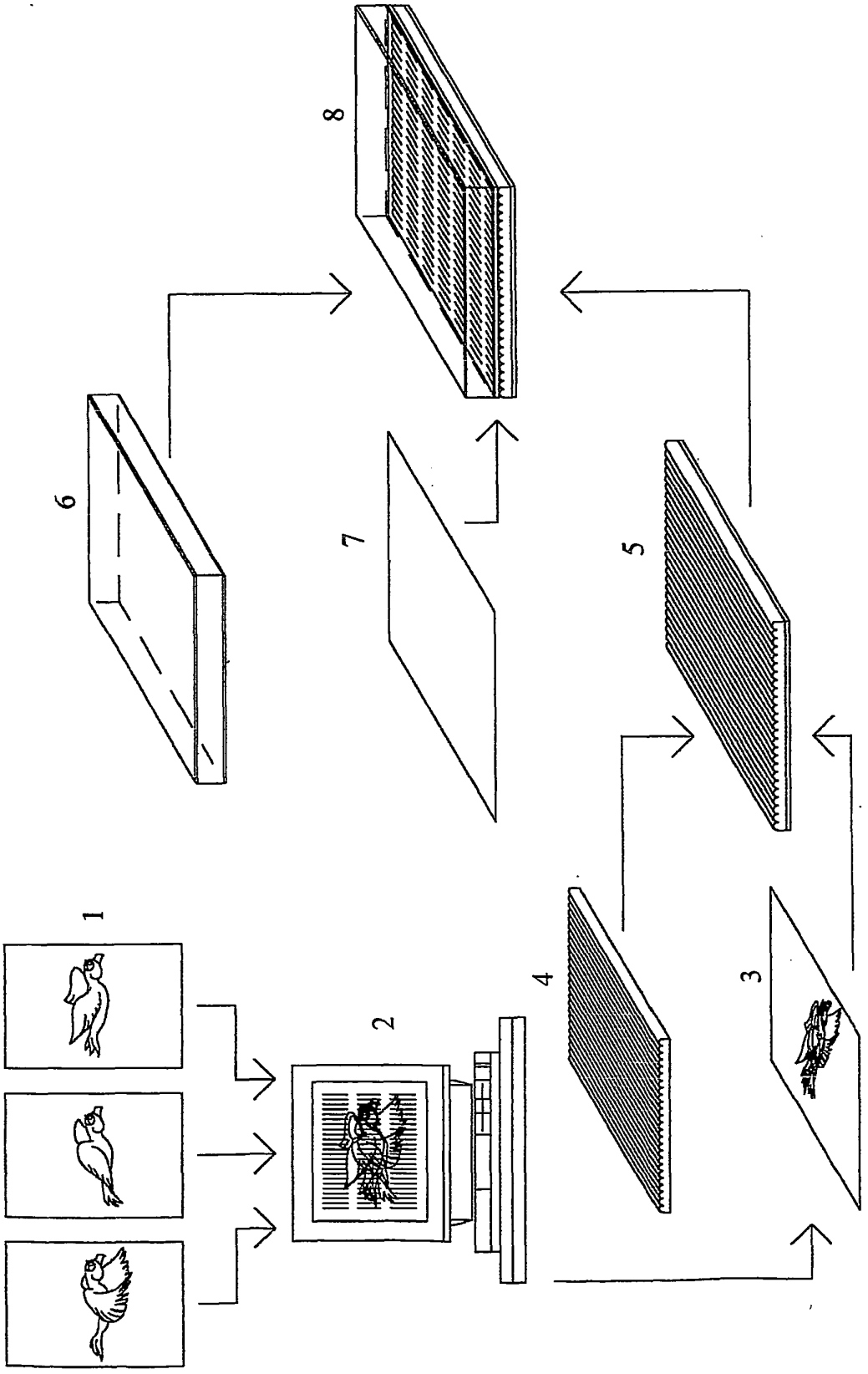

Fig.2